

**CLAIMS**

What is claimed is:

1. An implantable device for preventing sudden cardiac death, comprising:  
5 a housing configured for implantation in a patient;  
energy delivery circuitry provided in the housing, the energy delivery circuitry configured to deliver only two forms of cardiac therapy, the two forms of cardiac therapy comprising a non-physiologic, life sustaining pacing therapy and a therapy to treat a tachyarrhythmia;  
10 detection circuitry provided in the housing, the detection circuitry configured to detect cardiac rhythms;  
a lead system comprising one or more lead electrodes, the lead system coupled to the energy delivery circuitry and the detection circuitry; and  
control circuitry provided in the housing and coupled to the energy  
15 delivery circuitry and the detection circuitry, the control circuitry configured to coordinate delivery of the tachyarrhythmia therapy in response to detection of a tachyarrhythmia requiring treatment and delivery of the non-physiologic, life sustaining pacing therapy in response to detection of cardiac asystole.
- 20 2. The device of claim 1, wherein the tachyarrhythmia therapy comprises a single therapy to treat cardiac fibrillation.
3. The device of claim 1, wherein the pacing therapy comprises a single  
25 pacing therapy to treat the cardiac asystole.

4. The device of claim 1, wherein the tachyarrhythmia therapy comprises a single therapy to treat cardiac fibrillation, and the pacing therapy comprises a single pacing therapy to treat the cardiac asystole.

5 5. The device of claim 1, wherein the pacing therapy comprises a single pacing therapy to treat the cardiac asystole, and the tachyarrhythmia therapy comprises a first therapy to treat cardiac fibrillation and a second therapy to treat a tachycardia.

10 6. The device of claim 1, wherein the tachyarrhythmia therapy comprises a therapy to treat a tachycardia.

15 7. The device of claim 1, wherein the tachyarrhythmia therapy comprises an anti-tachycardia pacing therapy.

8. The device of claim 1, wherein the tachyarrhythmia therapy comprises a therapy to treat cardiac fibrillation.

20 9. The device of claim 1, wherein the tachyarrhythmia therapy comprises a monophasic defibrillation therapy.

10. The device of claim 1, wherein the tachyarrhythmia therapy comprises a biphasic defibrillation therapy.

25 11. The device of claim 1, wherein the tachyarrhythmia therapy comprises a therapy to treat tachycardia and a therapy to treat cardiac fibrillation.

12. The device of claim 1, wherein the energy delivery circuitry comprises a capacitor circuit and the tachyarrhythmia therapy comprises a defibrillation therapy and a cardioversion therapy, the cardioversion therapy delivered prior to or during charging of a capacitor of the capacitor circuit.

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13. The device of claim 1, wherein at least some of the lead electrodes are configured for intrathoracic placement.

14. The device of claim 1, wherein one or more of the lead electrodes are configured for subcutaneous non-intrathoracic placement.

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15. The device of claim 1, wherein the housing comprises a housing electrode.

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16. An implantable cardiac device for preventing sudden cardiac death, comprising:

a housing configured for implantation in a patient;

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energy delivery circuitry provided in the housing, the energy delivery circuitry configured to deliver only two forms of cardiac therapy, the two forms of cardiac therapy comprising a therapy to treat a tachyarrhythmia and a pacing therapy deliverable at a rate lower than a bradycardia pacing rate;

detection circuitry provided in the housing, the detection circuitry configured to detect cardiac rhythms;

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a lead system comprising one or more lead electrodes, the lead system coupled to the energy delivery circuitry and the detection circuitry; and

control circuitry provided in the housing and coupled to the energy delivery circuitry and the detection circuitry, the control circuitry configured to coordinate delivery of the tachyarrhythmia therapy in response to detection of a

tachyarrhythmia requiring treatment and delivery of the pacing therapy in response to detection of a cardiac condition requiring treatment.

5 17. The device of claim 16, wherein the pacing therapy comprises an asystole prevention therapy.

10 18. The device of claim 16, wherein the pacing therapy comprises a pacing therapy delivered at a rate varying between about 10 and about 40 pulses per minute.

19. The device of claim 16, wherein the pacing therapy comprises a pacing therapy delivered at a rate lower than about 30 pulses per minute.

15 20. The device of claim 16, wherein the control circuitry coordinates delivery of the pacing therapy at a rate insufficient to restore full patient consciousness.

20 21. The device of claim 16, wherein the control circuitry coordinates delivery of pacing pulses having pulse widths of between about 10 ms and about 30 ms.

25 22. The device of claim 16, wherein the control circuitry coordinates delivery of pacing pulses each having pulse widths of between about 0.06 ms and about 2 ms.

23. The device of claim 16, wherein the control circuitry coordinates delivery of a first pace pulse about 5 to 30 seconds subsequent to detection of the cardiac asystole.

5           24. The device of claim 16, wherein the control circuitry coordinates delivery of pacing pulses at a progressively increasing rate over a predetermined duration of time.

10           25. The device of claim 16, wherein the control circuitry coordinates delivery of pacing pulses at a progressively decreasing rate over a predetermined duration of time.

15           26. The device of claim 16, wherein the control circuitry coordinates delivery of pacing pulses at a substantially constant rate over a predetermined duration of time.

27. The device of claim 16, wherein the tachyarrhythmia therapy comprises a therapy to treat cardiac fibrillation.

20           28. The device of claim 16, wherein the tachyarrhythmia therapy comprises a therapy to treat a tachycardia.

25           29. The device of claim 16, wherein the pacing therapy comprises a therapy to treat cardiac asystole, and the tachyarrhythmia therapy comprises a first therapy to treat cardiac fibrillation and a second therapy to treat a tachycardia.

30. The device of claim 16, wherein each of the lead electrodes is configured for intrathoracic placement.

5 31. The device of claim 16, wherein at least some of the lead electrodes are configured for intrathoracic placement.

32. The device of claim 16, wherein one or more of the lead electrodes are configured for subcutaneous non-intrathoracic placement.

10 33. The device of claim 16, wherein the housing comprises a housing electrode.

34. The device of claim 16, wherein the lead system comprises at least one lead electrode configured for intrathoracic placement, and the housing comprises a  
15 housing electrode.

35. The device of claim 16, wherein at least three electrodes of the lead system are configured for intrathoracic placement.

20 36. The device of claim 16, wherein the lead system comprises a first coil electrode, a second coil electrode, and a tip electrode, the first coil electrode configured for placement within a superior vena cava of the heart, and the second coil and tip electrodes configured for placement within the right ventricle of the heart.

37. A method of preventing sudden cardiac death, comprising:  
providing an implantable device configured to deliver only two forms of cardiac therapy, the two forms of cardiac therapy comprising a therapy to treat a tachyarrhythmia and an asystole prevention pacing therapy;

5 detecting a cardiac condition necessitating cardiac therapy;  
delivering the tachyarrhythmia therapy in response to detecting a tachyarrhythmia requiring treatment; and  
delivering the pacing therapy in response to detection of cardiac asystole.

10 38. The method of claim 37, wherein the pacing therapy comprises a non-physiologic, life sustaining pacing therapy.

39. The method of claim 37, wherein the pacing therapy comprises a pacing therapy deliverable at a rate lower than a bradycardia pacing rate.

15 40. The method of claim 37, wherein the tachyarrhythmia therapy comprises only a cardiac defibrillation therapy.

20 41. The method of claim 37, wherein the tachyarrhythmia therapy comprises a first therapy to treat cardiac fibrillation and a second therapy to treat a tachycardia.

42. The method of claim 37, wherein the tachyarrhythmia therapy comprises an anti-tachycardia pacing therapy.

25 43. The method of claim 37, wherein the tachyarrhythmia therapy comprises a defibrillation therapy and an anti-tachycardia pacing therapy, the anti-

tachycardia pacing therapy delivered prior to or during capacitor charging associated with the defibrillation therapy.

5           44.    The method of claim 37, wherein the tachyarrhythmia therapy comprises a defibrillation therapy and a cardioversion therapy, the cardioversion therapy delivered prior to or during capacitor charging associated with the defibrillation therapy.

10           45.    The method of claim 37, wherein the tachyarrhythmia therapy comprises a monophasic defibrillation therapy.

            46.    The method of claim 37, wherein the tachyarrhythmia therapy comprises a biphasic defibrillation therapy.

15           47.    The method of claim 37, wherein the pacing therapy comprises a pacing therapy delivered at a rate varying between about 10 and about 40 pulses per minute.

20           48.    The method of claim 37, wherein the pacing therapy comprises a pacing therapy delivered at a rate lower than about 30 pulses per minute.

            49.    The method of claim 37, wherein the pacing therapy is delivered at a rate insufficient to restore full patient consciousness.

25           50.    The method of claim 37, wherein delivering the pacing therapy comprises delivering pacing pulses having a pulse widths of between about 10 ms and about 30 ms.



51. The method of claim 37, wherein delivering the pacing therapy comprises delivering pacing pulses having pulse widths of between about 0.06 ms and about 2 ms.

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52. The method of claim 37, wherein delivering the pacing therapy comprises delivering a first pace pulse about 5 to 30 seconds subsequent to detection of the cardiac asystole.

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53. The method of claim 37, wherein delivering the pacing therapy comprises delivering pacing pulses at a progressively increasing rate over a predetermined duration of time.

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54. The method of claim 37, wherein delivering the pacing therapy comprises delivering pacing pulses at a progressively decreasing rate over a predetermined duration of time.

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55. The method of claim 37, wherein delivering the pacing therapy comprises delivering pacing pulses at a substantially constant rate over a predetermined duration of time.

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56. The method of claim 37, wherein detecting the cardiac condition comprises sensing cardiac activity using at least one intrathoracic sensing vector.

57. The method of claim 37, wherein detecting the cardiac condition comprises sensing cardiac activity using at least one subcutaneous, non-intrathoracic sensing vector.

58. An implantable system for preventing sudden cardiac death,  
comprising:

means for delivering only two forms of cardiac therapy, the two forms of  
5 cardiac therapy comprising a therapy to treat a tachyarrhythmia and an asystole  
prevention pacing therapy;

means for detecting a cardiac condition necessitating cardiac therapy;

means for delivering the tachyarrhythmia therapy in response to detecting a  
tachyarrhythmia requiring treatment; and

10 means for delivering the pacing therapy in response to detection of cardiac  
asystole.

59. The system of claim 58, further comprising means for effecting  
communication between the system and a patient-external system.

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60. The system of claim 58, further comprising means for effecting  
communication between the system and an advanced patient management system.

61. An implantable cardiac device for preventing sudden cardiac death, comprising:

a housing configured for implantation in a patient;

5 energy delivery circuitry provided in the housing, the energy delivery circuitry configured to deliver a therapy to treat a tachyarrhythmia and a pacing therapy deliverable at a rate lower than a bradycardia pacing rate;

detection circuitry provided in the housing, the detection circuitry configured to detect cardiac rhythms;

10 a lead system comprising one or more lead electrodes, the lead system coupled to the energy delivery circuitry and the detection circuitry;

a memory configured to store no greater than two programmable parameters associated with therapy delivery; and

15 control circuitry provided in the housing and coupled to the memory, energy delivery circuitry, and detection circuitry, the control circuitry configuring the device for operation to prevent sudden cardiac death after programming the two or less programmable parameters and enabling an therapy On/Off parameter.

62. The device of claim 61, further comprising a patient-external interface device configured to communicate with the implantable cardiac device, the patient-  
20 external interface configured for hand-held portability.

63. The device of claim 61, further comprising a patient-external interface device configured to communicate with the implantable cardiac device, the patient-external interface comprising an user input arrangement and an audio output device.  
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64. The device of claim 63, wherein the patient-external interface excludes a display.

65. The device of claim 61, further comprising a patient-external interface device configured to communicate with the implantable cardiac device, the patient-external interface comprising a communications interface configured for  
5 communicating with a computer system or a network.

66. The device of claim 61, wherein the two or less programmable parameters comprise a rate threshold parameter and a sensing floor adjustment parameter.

10 67. An implantable cardiac device for preventing sudden cardiac death, comprising:

a housing configured for implantation in a patient;

energy delivery circuitry provided in the housing, the energy delivery  
15 circuitry configured to deliver a therapy to treat a tachyarrhythmia and a pacing therapy deliverable at a rate lower than a bradycardia pacing rate;

detection circuitry provided in the housing, the detection circuitry configured to detect cardiac rhythms;

a lead system comprising one or more lead electrodes, the lead system  
20 coupled to the energy delivery circuitry and the detection circuitry;

a memory configured to store less than ten programmable parameters associated with therapy delivery; and

control circuitry provided in the housing and coupled to the memory, energy delivery circuitry, and detection circuitry, the control circuitry configuring the  
25 device for operation to prevent sudden cardiac death after programming the programmable parameters and enabling an therapy On/Off parameter.